

C. REMARKS/ARGUMENTS

1. Status of the Claims

Applicant notes with appreciation that claims 1-17 have been allowed.

Claims 18, 19 and 21 have been amended in this paper. No new matter is added by these amendments to claims 18, 19 and 21.

Claim 20 has been canceled in this paper.

2. Objection to the Specification under 35 U.S.C. § 112, first paragraph

The Examiner states:

The specification is objected to under 35 U.S.C. 112 first paragraph as failing to provide an enabling disclosure. There is no teaching in the original disclosure of "one x-ray emissive element for emitting x-ray radiation . . . in response to said optical radiation transmitted to the distal end of the optical fiber."

Applicant respectfully disagrees.

Applicant respectfully submits that Applicant's original disclosure does teach an x-ray emissive element for emitting x ray radiation in response to the optical radiation transmitted to the distal end of the optical fiber. Following are some examples:

See e.g. Abstract of the disclosure, front page of U.S. Pat. No. 6,320,932 (the "'932 patent"), lines 16-19, in which elements for emitting x-ray radiation in response to light transmitted to a terminating end of a fiber optic cable is explicitly disclosed:

"The target assembly includes elements for emitting radiation in a predetermined spectral range, in response to light [i.e. optical radiation] transmitted to the terminating end."

See also '932 patent, Col. 8, lines 10-15, which describes how the target 228 produces x-rays, in response to laser light from a laser 220 shining down a fiber optical cable 202. In particular, Col. 9, lines 10-15 of the '932 patent describe a laser 220 as "shining down the fiber optical cable 202," to generate free electrons 216; which in turn strike the surface of the target 228 and produce x-rays:

In operation, the small semiconductor laser 220 shining down the fiber optical cable 202 activates the transmissive photocathode 222 which generates free electrons 216. The high voltage field between the cathode 222 and target 228 accelerates these electrons, thereby forcing them to strike the surface 228A of target 228 and produce x-rays.

'932 patent Col. 9, lines 10-15.

Finally, Col. 3, lines 44 - 45 and lines 61 - 63 of the '632 patent describe a target 26 that emits x-rays in response to incident accelerated electrons, which in turn are generated by optical activation (i.e., the electron beam generator 22 may be a thermionic emitter driven by a laser, or may be a photocathode irradiated by a laser source). Col. 3, lines 44-45 and lines 61:

*... an x-ray emitting (in response to incident accelerated electrons)
target 26. ...*

*... the electron beam generator 22 may include a thermionic
emitter (driven by a ... laser) or a photocathode (irradiated by an
LED or laser source).*

For all of the reasons set forth above, Applicant submits that Applicant's original disclosure does teach and disclose "one x-ray emissive element for emitting x-ray radiation . . . in response to said optical radiation transmitted to the distal end of the optical fiber," and therefore that Applicant's specification does provide an enabling disclosure under 35 U.S.C. § 112.

3. Rejection of Claims 18 and 20 under 35 U.S.C. § 112, first paragraph

Claims 18 and 20 stand rejected under 35 U.S.C. § 112 first paragraph.

In particular, the Examiner states: "Claims 18 and 20 stand rejected under 35 U.S.C. § 112 first paragraph for the reasons set forth in the objection to the specification."

For all of the reasons set forth above in section 2, Applicant submits that Applicant's original disclosure does teach and disclose "one x-ray emissive element for emitting x-ray radiation . . . in response to said optical radiation transmitted to the distal end of the optical fiber," and therefore that claims 18 and 20 all satisfy the requirements

of 35 U.S.C. § 112, first paragraph.

4. Rejection of Claim 21 under 35 U.S.C. § 112, first paragraph

Claim 21 stands rejected under 35 U.S.C. § 112, first paragraph. In particular, the Examiner states, *inter alia*:

Claim 21 is rejected under 35 U.S.C. § 112, first paragraph, because the specification, while being enabling for a probe with an optical light source at the proximal end of the optical fiber, does not reasonably provide enablement for a probe without an optical light source. . . .

In response, Applicant has amended claim 21 to recite an optical source at a proximal end of the optical fiber.

Applicant submits that, with this amendment, claim 21 satisfies all the requirements of 35 U.S.C. § 112, first paragraph, and is allowable.

5. Rejection of Claims 19 and 20 under 35 U.S.C. § 112, second paragraph

Claims 19 and 20 stand rejected under 35 U.S.C. § 112 second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner has pointed out that "[t]here is no antecedent basis for 'said catheter' in claim 19 and for 'said electron source' in claim 20."

In response, Applicant has amended claim 19, to replace "catheter" with "optical fiber. typographical errors. See section B above. Applicant submits that claim 19, as currently amended, now has proper antecedent basis. Claim 20 has been canceled for other reasons (see section 6 below).

6. Rejection of Claim 18-20 under 35 U.S.C. § 102(b)

Claims 18-20 stand rejected under 35 U.S.C. § 102(b), as being anticipated by U.S. Pat. No. 5428658 to Oettinger ("Oettinger"). The Examiner states:

Claims 18-20 are rejected under 35 U.S.C. 102(b) as being anticipated by

Oettinger (5428658). Oettinger discloses a flexible x-ray emitting probe comprising laser 220, fiber optic 202, flexible conductor 204, high voltage conductor 208, photocathode 216 and target 228.

In response, Applicant has canceled claim 20, and has amended independent claim 18 to include one of the limitations of claim 20, namely to recite that the x-ray target assembly further includes an optically driven thermionic emitter. No new matter is added by this amendment, support for which can be found for example in the '932 patent, Col. 3, lines 60-62 (. . . *the electron beam generator 22 may include a thermionic emitter (driven by a . . . laser).*

Applicant submits that independent claim 18, as currently amended, is not anticipated by Oettinger, and is allowable. Claim 18, as currently amended, recites an optically driven thermionic emitter. As acknowledged by the Examiner, Oettinger teaches a photocathode, not an optically driven thermionic emitter.

As known in the art, a photocathode is very different from a thermionic emitter. A photocathode causes electrons to be generated through the photoelectric effect, which is quantum phenomenon in which electrons are ejected from a surface of a photocathode, when light shine on the surface. No thermionic effect is involved when a photocathode emits electrons in response to light. In contrast, an optically-driven thermionic emitter, as disclosed in the specification on page 4, lines 28-29, emits electrons by thermionic emission, because of heat generated by an optical source. Photoemission (which occurs with a cathode) and thermionic emission are fundamentally different and distinguishable phenomena.

It is well established that a prior art reference anticipates a claim only if the reference discloses all the elements and limitations of the claim. If even one element or limitation of the claim is missing, a § 102 rejection fails. See e.g. Kalman v. Kimberly-Clark, 713 F.2d 760, 771, 218 U.S.P.Q. 781 (Fed. Cir. 1983).

Applicant respectfully submits that Oettinger does not anticipate the invention as recited in the amended independent claim 18, because (as explained in the previous

paragraph) Oettinger does not teach or suggest at least the following limitation of amended claim 18: "the x-ray target assembly further including an optically driven thermionic emitter adapted to generate electrons in response to the optical radiation transmitted through the optical fiber."

Claim 19 depends on claim 18, and therefore includes all the limitations of claim 18. Claim 19 is therefore allowable at least because it depends from an allowable base claim.


For these reasons, Applicant submits that amended claim 18, and claim 19 depending on claim 18, is allowable, and not anticipated under 35 U.S.C. § 102 (b) by Oettinger.

7. Conclusion

On the basis of the foregoing amendments, Applicant respectfully submits that all of the pending claims 1-19 and 21 are in condition for allowance. An early and favorable action is therefore earnestly solicited. If there are any questions regarding these amendments and remarks, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

Date: August 23, 2005


Elizabeth E. Kim, Reg. No. 43,334
McDermott, Will & Emery
28 State Street
Boston, MA 02109
(617) 535-4411
(617) 535-3800
E-mail: ekim@mwe.com